REMARKS/ARGUMENTS

This is in response to the office action of January 12, 2006. Claims 1 to 13, 15 and 17 to 25 are in the case.

Claim Amendments

In the Office Action dated January 12, 2006, the Examiner rejected claims 1 to 5, 7, 15 to 22 and 26 as being anticipated by United States Patent No. 6,519,539 (Freeman et al.). The Examiner's rejection of former claims 16 and 26 is respectfully traversed.

By the present amendments, claims 1 and 17 have been amended to incorporate the limitations of former claims 16 and 26, respectively, and former claims 16 and 26 have been cancelled. Thus, as amended, new claims 1 and 17 substantially correspond to former claims 16 and 26 respectively. It is therefore submitted that these amendments require only a cursory review by the Examiner, and consequently should be entered.

Response to Claim Rejections

In the Office Action the Examiner rejected claim 26 based on Figure 1 and column 5, lines 36 to 37 of Freeman et al. Specifically, the Examiner took the position that the feature of the present invention, that the load is connected to the plurality of cells in parallel with the current supply/draw means, is disclosed by the connection of elements 90, 100 and 110 as seen in Figure 1 of Freeman et al. It is respectfully submitted, however, that these elements cannot be said to be connected in parallel. Specifically, the test fuel cell 90 has only a single electrical input and output shown.

In contrast, as shown in Figures 2a and 2b as amended, and also in Figure 2c added, inputs 25 connect the control device 30 to the fuel cell stack 90 in parallel with the real load 200, which is separately connected to the fuel cell stack 90. As

outlined in the response to the previous office action, support for these amendments to the drawings can be found in paragraphs 11 and 35 of the specification as filed.

For analogous reasons, it is also respectfully submitted that claim 17, as amended, clears the prior art. Specifically, neither Freeman et al. nor the other art cited disclose both drawing a current from a plurality of cells to generate voltage and current signals indicative of voltage and current characteristics of the plurality of cells, while also driving a load using a current drawn from the plurality of cells in parallel with the current drawn to generate the voltage and current signals.

In view of the foregoing, favorable reconsideration and allowance of the application is respectfully requested. If there are any questions regarding this response, the Examiner is respectfully requested to contact Ian C. McMillan at the number indicated below.

Respectfully submitted,

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Claims:

1. (Currently Amended) An electrochemical system comprising

a plurality of cells;

a measuring device including a plurality of inputs connected across the plurality of cells to generate voltage and current signals indicative of voltage and current characteristics of the plurality of cells;

a load powered by the plurality of cells;

a current supply/draw means for superimposing modulated current values through the plurality of cells; and,

a controller for controlling at least one system operating condition based on the voltage and current characteristics received from the measuring device, the controller being connected to the measuring device, wherein the at least one system operating condition comprises at least one of temperature, humidity, and reactant flow rates, within the electrochemical system and the load is connected to the plurality of cells in parallel with the current supply/draw means.

2. (Original) The electrochemical system as defined in claim 1 wherein the current supply/draw means comprises a modulator.

3. (Original) The electrochemical system as defined in claim 2 wherein the modulator is an integral part of the controller.

4. (Original) The electrochemical system as defined in claim 2 wherein the plurality of inputs are connected across individual cells in the plurality of cells and the modulator is operable to superimpose modulated current values through the individual cells.

5. (Original) The electrochemical system as defined in claim 2 wherein the controller is operable to control, in real time, the at least one system operating

condition based on the voltage and current characteristics received from the measuring device.

6. (Original) The electrochemical system as defined in claim 2, wherein the controller is operable to alert an operator based on alarm conditions determined from the voltage and current characteristics received from the measuring device.

7. (Original) The electrochemical system as claimed in claim 2, wherein the modulator is arranged to superimpose the modulated current values in burst time periods for high frequency resistance measurement, with time periods between burst time periods of no superimposition of modulated current values.

8. (Original) The electrochemical system as claimed in claim 2, wherein the measuring device provides a plurality of primary channels for the measured voltage and current signals, there being one channel for the voltage across each cell, and wherein the measuring device includes a splitter for separating out at least the DC components of the voltages across the individual cells from the primary channels, the splitter having first channels as outputs for the DC components.

9. (Original) The electrochemical system as claimed in claim 8, wherein the splitter includes second channels as outputs for the AC components of the voltages across the individual cells.

10. (Original) The electrochemical system as claimed in claim 8, wherein the measuring device includes a plurality of instrumentation amplifiers connected to the inputs of the measuring device and having outputs providing the plurality of the primary channels and an analog multiplexer connected to at least the first channels from the channel splitter, wherein a multiplexer control line is connected between the controller and the analog multiplexer for controlling the analog multiplexer to switch sequentially between at least the first channels.

11. (Original) The electrochemical system as claimed in claim 10, which further includes a first analog to digital converter connected to the output of the analog multiplexer, a voltage data bus connected between the first analog to digital converter and the controller and an analog to digital control line connected between the controller and the first analog to digital converter for control thereof.

12. (Original) The electrochemical system as claimed in claim 11, wherein a current sensing device is provided connected in series with the individual cells for measuring the current, wherein the current sensing device is connected to the controller.

13. (Original) The electrochemical system as claimed in claim 12, wherein outputs of the current sensing device are connected to a current amplifier and wherein the current amplifier has an output for a current measurement signal connected to the controller.

14. (Canceled)

15. (Original) The electrochemical system as claimed in claim 2, wherein the controller includes an input, connectable to a computing device for supply of control signals for controlling the controller.

16. (Canceled)

17. (Currently Amended) A method of controlling at least one system operating condition of a multi-cell electrochemical system, the method comprising:

(a) superimposing modulated current values across a plurality of cells of the electrochemical device;

(b) drawing current from the plurality of cells to generate voltage and current signals indicative of voltage and current characteristics of the plurality of cells;

(c) driving a load using a load current drawn from the plurality of cells in parallel with the current drawn in step (b); and,

(d) controlling the at least one system operating condition based on the voltage and current characteristics of the plurality of cells, wherein the at least one system operating condition comprises at least one of temperature, humidity, and reactant flow rates, within the electrochemical system.

18. (Original) The method as defined in claim 17 wherein step (a) comprises superimposing the modulated current values across individual cells in the plurality of cells; and step (b) comprises drawing current from the individual cells to generate voltage and current signals indicative of voltage and current characteristics of the individual cells.

19. (Original) The method as claimed in claim 17, wherein step (a) is performed in burst time periods for high frequency resistance measurement, with time periods between burst time periods of no superimposition of modulated current values.

20. (Original) The method as claimed in claim 19, wherein step (a) comprises controlling the superimposing to provide a series of set interference conditions, and measuring, for each interference condition, at least some of the voltage and current characteristics of the electrochemical device.

21. (Original) A method as claimed in claim 20 wherein step (a) comprises varying a frequency of the superimposed current values; step (b) comprises generating the voltage and current signals at selected frequencies for the superimposed modulated current values, and determining from the voltage and current signals a plurality of real and imaginary components of the impedance of the individual cells; and, step (c) comprises controlling the at

least one system operating condition based on the plurality of real and imaginary components of the impedance of the individual cells.

22. (Original) A method as claimed in claim 19, wherein step (b) comprises connecting inputs of a plurality of differential amplifiers across individual cells of the electrochemical device, measuring the voltage and current of the cells with the plurality of differential amplifiers to generate the voltage and current signals, supplying the voltage and current signals to a multiplexer and operating the multiplexer to sequentially supply the voltage and current signals to a controller for performing step (c).

23. (Original) A method as claimed in claim 22, further comprising converting each voltage and current signal selected by the analog multiplexer to a digital signal in a voltage analog to digital converter.

24. (Original) A method as claimed in claim 23, further comprising providing a current sensing device connected in series with the cells for measuring the current through the load, measuring the voltage across the current sensing device to determine the current through the load and thereby generating a current measurement signal, and supplying the current measurement signal to the controller.

25. (Original) A method as claimed in claim 24, further comprising converting the current measurement signal to a digital current measurement signal, and supplying the digital current measurement signal to the controller.

26. (Canceled)